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IDAHO DEPARTMENT OF HEALTH & WELFARE

Bureau of Community and Environmental Health
Division of Health
Idaho Department of Health and Welfare

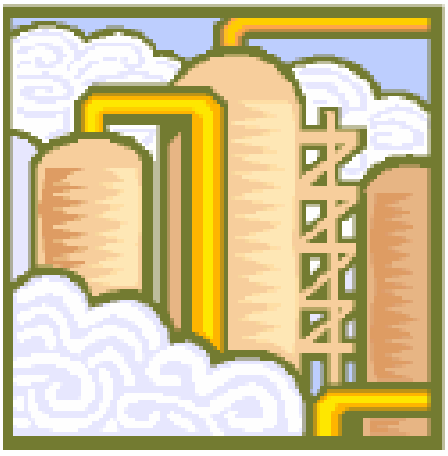
Health Effects of Selenium

What is Selenium?

Selenium is an essential nutrient for humans and animals. Selenium, however, is harmful to humans and animals when eaten in amounts that are much higher than the amounts needed for good nutrition.

Selenium is a naturally occurring substance that is widely, but unevenly, found in the rocks and soil of the earth. It is not often found in its pure form. It is usually combined with other substances. In the western states, the soils contain rather high levels of selenium compounds.

Selenium is most commonly produced as a byproduct of copper refining. Selenium compounds can be produced by roasting copper ore "slimes" with soda ash or sulphuric acid. Burning coal and oil also releases selenium into the environment.



What happens to selenium when it enters the environment?

- Small selenium particles in the air settle to the ground or are taken out of the air in rain.
- Selenium compounds deposited in agricultural fields from fertilizer use can be carried in irrigation drainage water.
- Plants easily take up selenium compounds from water and concentrate them.

Selenium can build up in animals that eat plants or other animals with high levels of selenium. It can also build up in animals that live in water containing high levels of selenium.

How might I be exposed to selenium?

- By eating food, drinking water, or taking dietary supplements that contain it.
- By living near a selenium rich area.
- By living near a hazardous waste site that contains selenium.
- By breathing air that contains selenium.

How might I be exposed to selenium?

Many people take daily selenium supplements. The Food and Drug Administration recommends that adults eat 55 micrograms of selenium a day. Selenium activates antioxidant enzymes. Some supplement manufacturers claim selenium can boost the immune system and prevent cancer. These claims have not been scientifically proven.

Humans are exposed daily to selenium in their food. Generally, the levels in food are enough to protect against diseases that may result from too little selenium. Most of the daily intake of selenium comes from eating grains, cereals, seafood and animal organs. The human body easily absorbs selenium from foods that are eaten. Selenium in drinking water is easily absorbed in the digestive tract. It is not easily absorbed through the skin. The human body can change selenium into forms the body can use. However, selenium can build up in the human body, leaving mainly in the urine.

Some plants can build up selenium to levels that are harmful to livestock and humans feeding on these plants. In these cases, humans can be exposed to too much selenium if they eat locally grown grains, vegetables, or animals that have built up high levels of selenium.

In fresh water containing high levels of selenium, fish may contain selenium at high levels. Humans can also be exposed to selenium in drinking water. Most of the water sources in the United States contain levels of selenium that are very low compared with levels found in food. Less than 1% of the daily intake of selenium is estimated to come from drinking water. At hazardous waste disposal sites, selenium can be washed from the soil into streams and lakes or flow into groundwater. This raises the amount of selenium in water above normal levels.

Humans are normally not exposed to large amounts of selenium in the air. People who work in metal industries, selenium-recovery processes, painting, and ore processing may be exposed to airborne selenium.

How can selenium affect my health?

Selenium can be harmful at daily dietary levels 5–10 times higher than the daily requirement. The seriousness of the effects of excess selenium depends on how much is eaten and how often. Accidentally swallowing a large amount of selenium (for example, a very large quantity of selenium supplement pills) could be fatal without immediate medical treatment. The exact levels at which these effects occur are not known.

If amounts of selenium only somewhat higher than needed were eaten for a year or more, several health effects could occur. These effects include brittle hair, deformed or discolored nails, loss of hair, tooth decay and discoloration, fatigue, liver and spleen damage, and, in extreme cases, loss of feeling and control in arms and legs. Currently, we do not know the exact exposure levels at which these effects may occur.

Short term exposure, 14 days or less, to selenium from inhalation of dust results in irritation of the mucous membranes in the nose and throat, producing coughing, nosebleeds, bronchial spasms, and chemical pneumonia. Short term exposure from inhalation of hydrogen selenide, a highly toxic selenium compound, results primarily in respiratory effects, such as irritation of the mucous membranes, pulmonary edema, severe bronchitis, and bronchial pneumonia. Indigestion, nausea, headaches, dizziness, and irritation of the eyes were also reported in humans who inhaled selenium compounds.

No information is available on the chronic (long-term) effects of selenium in humans from inhalation exposure. Upon contact with skin, selenium compounds have caused rashes, swelling, and pain.

What are the effects of selenium on livestock?

"Blind staggers" is a disease in livestock that results from short term consumption of plants high in selenium. It is characterized by impaired vision, aimless wandering behavior, reduced consumption of food and water, and paralysis. "Alkali disease" is a disease in livestock resulting from long-term consumption of high levels of selenium. It is characterized by hair loss, deformation and sloughing of the hooves, erosion of the joints of the bones, anemia, and effects on the heart, kidney, and liver.

How likely is selenium to cause cancer?

The U.S. Department of Health and Human Services has determined that selenium sulfide may cause cancer. Selenium sulfide is used in some anti-dandruff shampoos. It is not present in foods and is very different from selenium compounds found in foods and in the environment. Because selenium sulfide is not easily absorbed through the skin, use of shampoos containing this compound is considered safe unless a person has open cuts or sores on the scalp or hands.

Studies of laboratory animals and people show that most selenium compounds probably do not cause cancer. In fact, some studies of human populations showed that not enough selenium in the diet might increase the risk of cancer. But diets high in selenium do not reduce the risk of developing cancer and may increase the risk of selenium poisoning.

Has the federal government made recommendations to protect human health?

The federal government has developed standards and guidelines to regulate exposure to selenium in the environment and to protect individuals from possible adverse health effects. The Environmental Protection Agency maximum contaminant level for selenium in drinking water is 50 parts of selenium per billion parts of water (50 ppb). The Food and Drug Administration maximum allowable level selenium in bottled water is also 50 ppb. The Occupational Safety and Health Administration exposure limit for selenium compounds in workplace air is 0.2 milligrams of selenium per cubic meter of air for an 8-hour day over a 40-hour workweek.

How can I get more information?

The Bureau of Community and Environmental Health (BCEH), Idaho Division of Health, works with the Agency for Toxic Substances and Disease Registry to protect human health from dangerous substances in the environment. BCEH has an Environmental Health Education and Assessment Program to inform and educate the citizens of Idaho about these substances at hazardous waste sites and the activities being conducted at these sites. This fact sheet has been created to assist you in understanding the potential health effects of exposure to selenium in the environment.

For Additional Information Contact:

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